For spinal cord, brain stem and mandible the analysis included the maximum dose (in terms of D2%); for parotids, salivary glands, esophagus, larynx and thyroid Dmean and a number of different dose-volume data in the range V20Gy e V50Gy were compared.For comparison of the efficiency of IMRT and CDR-VMAT, the MUs and treatment delivery time were also recorded and evaluated.

Results: Results are shown in Table.

		IMRT	CDR-VMAT	p value
PTV_{66Gy}	$D_{98\%}$	60,5 ± 1,4 Gy	60,7 ± 1,7 Gy	0,799
	$D_{50\%}$	65,7 ± 0,4 Gy	65,8 ± 0,2 Gy	0,759
	$D_{2\%}$	68,4 ± 0,8 Gy	67,6 ± 0,7 Gy	0,013
	D_{mean}	65,5 ± 0,4 Gy	65,5 ± 0,2 Gy	0,838
	HI	0,13 ± 0,03	0,11 ± 0,03	0,028
PTV_{60Gy}	$D_{98\%}$	54,3 ± 1,6 Gy	54,8 ± 2,1 Gy	0,445
	$D_{50\%}$	59,9 ± 0,4 Gy	59,8 ± 0,4 Gy	0,799
	$D_{2\%}$	63,9 ± 1,2 Gy	62,5 ± 1,4 Gy	0,011
	D_{mean}	59,8 ± 0,3 Gy	59,7 ± 0,3 Gy	0,386
	HI	0,16 ± 0,04	0,13 ± 0,05	0,093
$PTV54_{Gy}$	$D_{98\%}$	48,8 ± 1,4 Gy	49 ± 1,8 Gy	0,919
	$D_{50\%}$	54,2 ± 0,6 Gy	54,1 ± 0,5 Gy	0,414
	$D_{2\%}$	59,2 ± 2,1 Gy	58,3 ± 2,2 Gy	0,059
	D_{mean}	54,2 ± 0,6 Gy	54 ± 0,5 Gy	0,241
	HI	0,17 ± 0,06	0,15 ± 0,07	0,005
Mandible	$D_{2\%}$	53 ± 10,5 Gy	52,9 ± 10,2 Gy	0,799
	V_{50Gy}	15,1 ± 16,1 %	15,8 ± 15,9 %	0,612
Spinal cord	$D_{2\%}$	38,2 ± 2,0 Gy	38,1 ± 1,0 Gy	0,575
Brain stem	$D_{2\%}$	34,0 ± 9,4 Gy	34,1 ± 7,4 Gy	1,000
Larynx	D_{mean}	46,4 ± 6,8 Gy	43 ± 5,7 Gy	0,025
	V_{20Gy}	100,0 ± 0,0 %	97,4 ± 7,4 %	0,317
	V_{30Gy}	91,9 ± 7,2 %	83,5 ± 12,6 %	0,025
	V_{50Gy}	37,5 ± 28 %	28,8 ± 21,5 %	0,108
Thyroid	D_{mean}	43,4 ± 11,4 Gy	41 ± 11,9 Gy	0,047
	V_{20Gy}	87,5 ± 20,1 %	85 ± 24,7 %	0,498
	V_{45Gy}	68,2 ± 31,0 %	55,4 ± 27,3 %	0,038
	V_{50Gy}	45,9 ± 31,9 %	31,6 ± 27,7 %	0,028
Esophagus	V_{20Gy}	56,2 ± 23,1 %	49,6 ± 25,0 %	0,110
	V_{30Gy}	42,1 ± 23,6 %	37,6 ± 20,0 %	0,209
	V_{50Gy}	6,2 ± 10,4 %	2,8 ± 4,5 %	0,068
Parotid R/L	D_{mean}	24,4 ± 2 Gy / 24 ± 1,5 Gy	23,6 ± 1,3 Gy / 23,4 ± 1,1 Gy	0,059 / 0,093
	V_{15Gy}	61,4 ± 9,2 % / 62,8 ± 6,3 %	58,2 ± 5,3 % / 61,9 ± 7,5 %	0,477 / 0,877
	V_{30Gy}	38,4 ± 5,3 % / 37,7 ± 5,6 %	33,9 ± 4 % / 32,3 ± 3,6 %	0,037 / 0,019
	V_{50Gy}	8,2 ± 4,4 % / 5,2 ± 3,9 %	7,1 ± 3,4 % / 4,7 ± 3,5 %	0,121 / 0,347
Salivary Gland R/L	D_{mean}	46,2 ± 12,3 Gy / 44,4 ± 11,1 Gy	39,1 ± 12,6 Gy / 37,2 ± 13,8 Gy	0,005 / 0,028
	V_{15Gy}	96,3 ± 8,1 % / 96,8 ± 9,7 %	93,7 ± 10,8 % / 93,9 ± 12,5 %	0,197 / 0,109
	V_{30Gy}	84,5 ± 22,4 % / 87,3 ± 21,9 %	67,9 ± 31,7 % / 62,4 ± 28,8 %	0,027 / 0,042
	V_{50Gy}	47,1 ± 43,5 % / 37,4 ± 36,1 %	29,3 ± 36,9 % / 20,6 ± 32,2 %	0,017 / 0,05
Delivery time / MU		183 ± 18 s / 613 ± 92	145 ± 21 s / 743 ± 73	0,005 / 0,016

Differences were analysed using the paired samples Wilcoxon test (significance level 0,05). Although differences were not always statistically significant, on the one hand CDR-VMAT improved HI and decreased D2% for PTVs, on the other hand it showed a reduction in the volume of the OARs receiving medium and high doses and medium doses to larynx, thyroid, parotid and salivary glands. In respect of some organs, such as the esophagus, a larger number of patients enrolled in the study would likely have resulted in statistically significant differences. Compared with IMRT, CDR-VMAT reduced delivery times although MUs were higher.

Conclusion: Our study showed that CDR-VMAT offers an additional option of rotational arc radiotherapy for linacs without variable dose rate with a lower cost.

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Angle-restricted tomotherapy to reduce the risk of heart for left-sided breast cancer patients

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Purpose or Objective: The aim of this study was to evaluate the feasibility of complete-directional-complete block (CDCB) technique and to find the optimal restricted angle of helical tomtherapy (HT) in planning of locoregional irradiation including the internal mammary chain (IMC) in left-sided breast cancer.

Material and Methods: Treatment plans were generated for 6 left-sided breast cancer patients with a planning target volume (PTV) included the breast/chest wall, supra-clavicular, axillary nodes and IMC. In HT plans, complete block (CB) and CDCB were designated to spare the contra-lateral tissues: (1) CB was a rectangular structure with the ends connected to 10-cm away from the margin of the PTV (2) the directional-blocking area of CDCB was determined by the intersection of CB and the beam aperture passed through the 0.5 cm margin of IMC. To find the optimal CDCB, the angle of 0, 10, 15 and 20 degree of the beam according to the geometric center of IMC were used. A prescribed dose of 50 Gy in 25 fractions was planned for HT plans using CB, CDCB 0,10,15,20 and conventional 5-field intensity-modulated radiotherapy (cIMRT). The dose coverage, homogeneity index (HI), conformity index (CI) of the target, and the dose volumes of critical structures were compared.

Results: The coverage, HI and CI of PTV in HT-CDCB 0,10,15,20 were better than those in cIMRT but did not differ from HT-CB. The mean V20 Gy of the ipsilateral lung for HT-CDCB 15 (22.2%±3.1%, p=0.029) and HT-CDCB 20 (22.1%±3.5%, p=0.045) were significant reduced compared to cIMRT (27.9%±3.4%). With the increasing angle of CDCB, the cardiac V30 Gy for HT-CDCB was gradually decreased and significantly lower than for cIMRT and HT-CB. Compared with cIMRT (24.3 Gy±6.9 Gy), the mean dose of left anterior descending coronary artery was effectively reduced 38.6%, 43.3%, 45.8% and 48.1% in CDCB 0,10,15,20, respectively. There was no significant difference in contralateral breast for all plans. However, the mean dose of contralateral lung in HT-CDCB 20 was 6.1% higher than cIMRT (1.7 versus 1.6 Gy) and 14.5% than HT-CDCB 15

Conclusion: CDCB technique is feasible for locoregional irradiation including the IMC in left-sided breast cancer patients treated with helical tomotherapy. Considering the mean dose of the contralateral lung, the optimal angle for CDCB could be 15-degree that not only achieved similar PTV coverage, homogeneity and dose conformity but also allowed better sparing heart and bilateral lungs compared with cIMRT.

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Dosimetric comparison of Helical Tomotherapy and VMAT for endometrial cancer

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Purpose or Objective: The purpose of the present study was to evaluate dosimetric comparision of volumetric modulated arc therapy(VMAT) and helical tomotherapy(HT) for patients with endometrial cancer.

Material and Methods: Fourteen patients with endometrial cancer were retrospectively studied.All whole pelvis(WP) patients were treated with 50.4 Gy in 28 fractions..The dose distributions for the planning target volume (PTV),organs at risk(OARs),monitor unit(MU) and homogeneity index(HI= D2-D98/Dmedian) were analyzed.

Results: The V93 and D100 of PTV were 99.8% ,99.4% and 46.3 Gy,48.2 Gy for the VMAT and HT,respectively(p:0.004,p:0.003) .The V20 for the bowels was 44.5 Gy and 51.1 Gy for the VMAT and HT, respectively(p:0.001). The sparing OARs were comparable between the VMAT and HT plans. There is a significance difference between MU for the VMAT and HT plans and the value was given by 645 and 5236 MU(p:0.001) and the average homogeneity index was 0.07 and 0.04 (p:0.002),respectively.

Conclusion: Both HT and VMAT plans yielded with homogeneous dose distrubition when sparing of OARs effectively. Although some dosimetric parameters have shown significant differences statistically but they were